CLAIMS

What is claimed is:

1. A receiver comprising:

a plurality of antenna elements for receiving a data signal;

for each antenna element, a plurality of Rake fingers coupled to the antenna element, each finger having a delay, a despreader and a complex weight gain weighing device;

a complex weight gain generation device coupled to an output of each despreader and an input of each complex weight gain device; and

a summer coupled to an output of each complex weight gain device, producing an estimate of the data signal.

2. The receiver of claim 1 wherein for each Rake finger, the delay is coupled to its antenna, the despreader is coupled to an output of the delay and the complex weight gain device is coupled to an output of the despreader.

3. A receiver comprising:

a plurality of antenna elements for receiving a data signal;

for each antenna element, a plurality of Rake fingers, each Rake finger for processing a received multipath component of the received data signal of its antenna element by applying a complex weight gain to that received multipath component;

a complex weight gain generator for determining the complex weight gain for each Rake finger for each antenna element using an input from all of the Rake fingers; and

a summer for combining an output of each Rake finger to produce an estimate of the data signal.

4. The receiver of claim 3 wherein each Rake finger includes a despreader and the input from all of the Rake fingers is an output from the despreader of all the Rake fingers.

5. The receiver of claim 4 wherein the complex weight gain generator determines the complex weight gains by taking a complex conjugate transpose of an inverse of a noise correlation matrix multiplied by a channel estimate, producing complex weight gains.

6. The receiver of claim 5 wherein the noise correlation matrix is derived by averaging a multiplication of a channel estimate with its complex conjugate transpose over each Rake finger, producing a first matix, and averaging a multiplication of the output of each despreader with its complex conjugate transpose over each Rake finger, producing a second matrix, and subtracting the first matrix from the second matrix, producing the noise correlation matrix.

7. The receiver of claim 5 wherein the complex weight gain applied at each finger is an element of a resulting vector of the produced complex weight gains.

8. A receiver comprising:

a plurality of antenna element means for receiving a data signal;

for each antenna element means, a plurality of Rake finger means;

each Rake finger means for processing a received multipath component of the received data signal of its antenna element means by applying a complex weight gain to that received multipath component;

a complex weight gain generating means for determining the complex weight gain for each Rake finger means for each antenna element means using an input from all the Rake finger means; and

means for combining an output of each Rake finger means to produce an estimate of the data signal.

9. The receiver of claim 8 wherein each Rake finger means having a means for despreading and the input from all of the Rake finger means is an output from the despreading means of all the Rake finger means.

10. The receiver of claim 9 wherein the complex weight generating means for determining the complex weight gains by taking a complex conjugate transpose of an inverse of a noise correlation matrix multiplied by a channel estimate, producing complex weight gains.

11. The receiver of claim 10 wherein the noise correlation matrix is derived by averaging a multiplication of a channel estimate with its complex conjugate transpose over each Rake finger means, producing a first matrix, and averaging a multiplication of the output of each despreading means with its complex conjugate transpose over each Rake finger means, producing a second matrix, and subtracting the first matrix from the second matrix, producing the noise correlation matrix.

12. The receiver of claim 10 wherein the complex weight gain applied at each Rake finger means is an element of a resulting vector of the produced complex weight gains.

13. A wireless transmit/receive unit (WTRU) comprising:

a plurality of antenna elements for receiving a data signal;

for each antenna element, a plurality of rake fingers coupled to the antenna element, each finger having a delay, a despreader and a complex weight gain weighing device;

a complex weight gain generation device coupled to an output of each despreader and an input of each complex weight gain device; and

a summer coupled to an output of each complex weight gain device, producing an estimate of the data signal.

14. The WTRU of claim 13 wherein for each Rake finger, the delay is coupled to its antenna, the despreader is coupled to an output of the delay and the complex weight gain device is coupled to an output of the despreader.

15. A wireless transmit/receive unit (WTRU) comprising:

a plurality of antenna elements for receiving a data signal;

for each antenna element, a plurality of Rake fingers, each Rake finger for processing a received multipath component of the received data signal of its antenna element by applying a complex weight gain to that received multipath component;

a complex weight gain generator for determining the complex weight gain for each Rake finger for each antenna element using an input from all the Rake fingers; and

a summer for combining an output of each Rake finger to produce an estimate of the data signal.

16. The WTRU of claim 15 wherein each Rake finger having a despreader and the input from all the Rake fingers is an output from the despreader of all the Rake fingers.

17. The WTRU of claim 16 wherein the complex weight generator determines the complex weight gains by taking a complex conjugate transpose of an inverse of a noise correlation matrix multiplied by a channel estimate, producing complex weight gains.

18. The WTRU of claim 17 wherein the noise correlation matrix is derived by averaging a multiplication of a channel estimate with its complex conjugate transpose over each Rake finger, producing a first matrix, and averaging a multiplication of the output of each despreader with its complex conjugate transpose over each Rake finger, producing a second matrix, and subtracting the first matrix from the second matrix, producing the noise correlation matrix.

19. The WTRU of claim 17 wherein the complex weight gain applied at each finger is an element of a resulting vector of the produced complex weight gains.

20. A wireless transmit/receive unit (WTRU) comprising:

a plurality of antenna element means for receiving a data signal;

for each antenna element means, a plurality of Rake finger means, each Rake finger means for processing a received multipath component of the received data signal of its antenna element means by applying a complex weight gain to that received multipath component;

a complex weight gain generating means for determining the complex weight gain for each Rake finger means for each antenna element means using an input from all the Rake finger means; and

means for combining an output of each Rake finger means to produce an estimate of the data signal.

21. The WTRU of claim 20 wherein each Rake finger means having a means for despreading and the input from all the Rake finger means is an output from the despreading means of all the Rake finger means.

22. The WTRU of claim 21 wherein the complex weight generating means for determining the complex weight gains by taking a complex conjugate transpose of an inverse of a noise correlation matrix multiplied by a channel estimate, producing complex weight gains.

23. The WTRU of claim 22 wherein the noise correlation matrix is derived by averaging a multiplication of a channel estimate with its complex conjugate transpose over each Rake finger means, producing a first matrix, and averaging a multiplication of the output of each despreading means with its complex conjugate transpose over each Rake finger means, producing a second matrix, and subtracting the first matrix from the second matrix, producing the noise correlation matrix.

24. The WTRU of claim 22 wherein the complex weight gain applied at each Rake finger means is an element of a resulting vector of the produced complex weight gains.

25. A base station comprising:

a plurality of antenna elements for receiving a data signal;

for each antenna element, a plurality of rake fingers coupled to the antenna element, each finger having a delay, a despreader and a complex weight gain weighing device;

a complex weight gain generation device coupled to an output of each despreader and an input of each complex weight gain device; and

a summer coupled to an output of each complex weight gain device, producing an estimate of the data signal.

26. The base station of claim 25 wherein for each Rake finger, the delay is coupled to its antenna, the despreader is coupled to an output of the delay and the complex weight gain device is coupled to an output of the despreader.

27. A base station comprising:

a plurality of antenna elements for receiving a data signal;

for each antenna element, a plurality of Rake fingers, each Rake finger for processing a received multipath component of the received data signal of its antenna element by applying a complex weight gain to that received multipath component;

a complex weight gain generator for determining the complex weight gain for each Rake finger for each antenna element using an input from all the Rake fingers; and

a summer for combining an output of each Rake finger to produce an estimate of the data signal.

28. The base station of claim 27 wherein each Rake finger having a despreader and the input from all the Rake fingers is an output from the despreader of all the Rake fingers.

29. The base station of claim 28 wherein the complex weight generator determines the complex weight gains by taking a complex conjugate transpose of an inverse of a noise correlation matrix multiplied by a channel estimate, producing complex weight gains.

30. The base station of claim 29 wherein the noise correlation matrix is derived by averaging a multiplication of a channel estimate with its complex conjugate transpose over each Rake finger, producing a first matrix, and averaging a multiplication of the output of each despreader with its complex conjugate transpose over each Rake finger, producing a second matrix, and subtracting the first matrix from the second matrix, producing the noise correlation matrix.

31. The base station of claim 29 wherein the complex weight gain applied at each finger is an element of a resulting vector of the produced complex weight gains.

32. A base station comprising:

a plurality of antenna element means for receiving a data signal;

for each antenna element means, a plurality of Rake finger means, each Rake finger means for processing a received multipath component of the received data signal of its antenna element means by applying a complex weight gain to that received multipath component;

a complex weight gain generating means for determining the complex weight gain for each Rake finger means for each antenna element means using an input from all the Rake finger means; and

means for combining an output of each Rake finger means to produce an estimate of the data signal.

33. The base station of claim 32 wherein each Rake finger means having a means for despreading and the input from all the Rake finger means is an output from the despreading means of all the Rake finger means.

34. The base station of claim 33 wherein the complex weight generating means for determining the complex weight gains by taking a complex conjugate transpose of an inverse of a noise correlation matrix multiplied by a channel estimate, producing complex weight gains.

35. The base station of claim 34 wherein the noise correlation matrix is derived by averaging a multiplication of a channel estimate with its complex conjugate transpose over each Rake finger means, producing a first matrix, and averaging a multiplication of the output of each despreading means with its

complex conjugate transpose over each Rake finger means, producing a second matrix, and subtracting the first matrix from the second matrix, producing the noise correlation matrix.

36. The base station of claim 34 wherein the complex weight gain applied at each Rake finger means is an element of a resulting vector of the produced complex weight gains.

37. An integrated circuit (IC) for processing a data signal comprising:

an input configured to receive an output from a plurality of antenna elements;

for each antenna element input, a plurality of rake fingers coupled to the antenna element input, each finger having a delay, a despreader and a complex weight gain weighing device;

a complex weight gain generation device coupled to an output of each despreader and an input of each complex weight gain device; and

a summer coupled to an output of each complex weight gain device, producing an estimate of the data signal.

38. The IC of claim 37 wherein for each Rake finger, the delay is coupled to its antenna, the despreader is coupled to an output of the delay and the complex weight gain device is coupled to an output of the despreader.